FACTSHEET

ANIMAL SCIENCE

ORDER NO. 06-083

SEPTEMBER 2006

AGDEX 415/20

Ontario Ministry of Agriculture, Food and Rural Affairs

MANAGEMENT OF GRAIN-FED VEAL CALVES

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(Replaces OMAFRA Factsheets *Pre-Weaning Management of Grain-Fed Veal Calves*, Order No. 92-019, and *Post-Weaning Management of Grain-Fed Veal*, Order No. 93-015)

INTRODUCTION

The goal of grain-fed veal producers is to achieve the desired finish at the desired weight and age. Calves sold through auction markets should weigh 295–320 kg (650–705 lb) and show a smooth, slick hair coat with fat visible around the tail head and well-covered ribs. Average daily gains should be 1.2 kg or better, while feed conversion should be 3.3–3.6 kg per kg of live weight gain.

ACQUIRING CALVES

The majority of calves (mostly Holstein males) destined to become grain-fed veal are purchased direct from dairy farms, at community auction barns or from commissioned buyers or calf dealers.

Calves should be at least 8 days of age when they are purchased. Some producers prefer to purchase weaned or "started" or "preconditioned" calves.

The purchase of calves from local dairy farms, although a sound practice, does not lend itself to filling a room or barn quickly. It may, however, be an ideal situation for growers who have time to supervise individual feeding programs for several calves, or for calves being started in a hutch housing system. Growers purchasing calves directly from dairy farms can make special arrangements to ensure that calves receive adequate colostrum and injections of vitamins and selenium at birth.

Many calves will originate from sale barns. Buying from sale barns has several disadvantages, but this method of acquisition is, in many instances, the only way to obtain a large group of calves in a few days.

Buying calves through sale barns is high risk, as their age, past management and health status are generally unknown, and there is a risk of exposing the calf to stress through co-mingling, trucking and handling.

Choosing a reputable calf dealer is vital to success. The price negotiated for calves is based on weight, sex, breed, physical condition and apparent health status. Be sure that the buyer fully understands all instructions regarding acceptable weight, quality, type, sex and cost of calves. Discuss the type of truck, the distance travelled and the person or persons handling the calves. Ensure no other livestock will be transported with young calves. Take every effort to reduce stress for these calves.

Upon arrival, calves should be alert and aggressive. Carefully inspect calves individually for:

- enlarged, sore or herniated navels
- nasal discharge
- hunched backs
- drooped ears
- ear infection
- swollen joints
- signs of scours (e.g., wet tails, loose manure)

Have agreements in place with suppliers or order buyers for the immediate return or refusal of sick calves.

All calves are required to be ear tagged at the place of birth with tags approved by the Canadian Cattle Identification Agency. It is a good production practice to record all the ear tag numbers, add additional management ear tags if desired and weigh calves before placing them in pens. This is the first step in developing a good record-keeping system. Weighing calves also provides a measure of feeding programs together with other variables such as season, source of calves and current management.

Move and place calves in stalls or pens carefully. Gentle handling and individual attention throughout the production cycle will reduce stress and increase

productivity in calves. Allowing calves to rest for approximately 2–3 hr between being placed in stalls or pens and the first feeding provides an opportunity for the animals to adjust to their new surroundings. Calves need to be kept dry and well bedded.

To allow early detection of disease and easier treatment with less stress, house newly purchased bob calves separately in pens or huts. House weaned calves in groups of 10 or less, if possible. Separate them from existing calves for at least 1 month. It is important, especially in cold weather, to have adequate bedding and a comfortable environment free from drafts. Be prepared to spend sufficient time getting calves fully acquainted with feed and watering locations.

Check calves 2 or 3 times per day for signs of disease, especially during the first 2 to 3 weeks.

Pneumonia is usually the most common problem. Signs of pneumonia include listlessness, droopy ears, discharges from nostrils, eyes and mouth, increased respiration rate and an elevated temperature. Calves with temperatures of 39.4°C (102.9°F) and above require medication for 2 to 3 days. In many cases, prescription drugs and consultation with your veterinarian will be required. A crowd gate in group pens will facilitate catching and restraining animals needing medication.

Prior to the arrival of the calves, have all the necessary feed, medication, injectable iron, vitamins and electrolytes on hand.

No specific arrival program is appropriate for all calves. Consult with your veterinarian and a successful grower. Injections of vitamins, selenium, iron, vaccines and the application of products to eliminate parasites are usually suggested. Many products used for the above purposes are prescription drugs and may only be used at the discretion of a veterinarian.

Depending on the travelling time between the farm of origin and the veal grower's barn, calves may require electrolytes in addition to their regular diet of milk. The purpose of providing an electrolyte is to quickly replenish body fluids and essential minerals, especially sodium, potassium and chloride. Two litres per calf fed 2 to 3 times during the first 24 hr after arrival is often recommended. Consult the product label and your veterinarian for complete recommendations.

Feeding a high-energy electrolyte solution is best. The solution should contain glucose, dextrose or acetate to promote the uptake of electrolytes in the small intestine. Feed electrolytes in addition to the normal milk diet and preferably between the scheduled milk feeding times. Feed oral electrolyte solutions containing bicarbonate at least 4 hr after feeding milk as they can interfere with milk digestion.

Some electrolyte formulas are not designed as a treatment for scouring calves, but instead are sold as a "supplement" for calves during periods of stress. These "supplement" formulas are intended to be fed as supplements in drinking water or milk replacer and are less concentrated.

It is best to feed from buckets. Nipples are harder to clean and sanitize and generally result in higher mortality. Teaching calves to drink from buckets requires patience. Allocate time to this chore, and make a concerted effort to get all calves to drink. The usual procedure is to have the calf suck on a finger or two, then inconspicuously and gently lead it to the milk. With the fingers still inside the calf's mouth, offer a progressively larger volume of milk by slowly separating the fingers. As the calf becomes accustomed to sucking the milk, gradually remove the fingers. It may be necessary to repeat this procedure with some calves.

SANITATION

Manure, milk and milk replacers provide an ideal medium for bacterial growth. It is, therefore, essential to sanitize housing, feeding and milk-mixing equipment to prevent the occurrence and spread of digestive and respiratory diseases.

Where barns or nurseries are used to start calves, an "all-in, all-out" system is recommended. The "all-in, all-out" method of starting calves provides an opportunity to thoroughly clean and disinfect housing, feeding and milk replacer mixing equipment.

Begin with the removal of accumulated manure and dirt. Clean walls, floors and stalls thoroughly using a high-pressure washer, then disinfect before stalls and pens are allowed to dry completely. Having stalls sanitized, dry and unoccupied for at least 7 days disrupts the cycle of microbial growth. Read the label and follow the manufacturer's recommendations. This will assure the effectiveness of the product and your safety.

Procedures used in cleaning milking equipment on dairy farms can be adapted to most veal operations. The recommended cleaning procedure for feeding equipment is:

- Rinse all buckets, bottles, nipples, lines and mixers with lukewarm water. Hot water will cause milk proteins to stick to equipment surfaces and provide a place for bacteria to grow.
- Wash using a sanitizing soap and bleach in hot water. Make sure the temperature is kept above 50°C (122°F) throughout this wash.

- Rinse with acid using warm water. Do not rinse off the acid.
- Allow buckets and bottles to drain and dry on a shelf or rack. Do not stack buckets or place them upside down on a floor.

When feed is delivered through hoses, it may be necessary to dismantle hose fittings, clamps and the milk pump.

NUTRITIONAL REQUIREMENTS

The Holstein calf's ability to grow rapidly is dictated by genetics, management, environment and nutrition. The ideal market-ready animal should weigh between 295–320 kg at 28–32 weeks. This leaves little room for feeding rations that are not correctly formulated. Most feed companies have programs for grain-fed veal. Consult with these companies to determine the program most suited to your situation.

The nutrient requirements for grain-fed veal have not been researched to the extent of other animal species. The 2001 National Research Council publication *Nutrient Requirements of Dairy Cattle* provides recommendations for pre-weaned veal calves gaining a maximum of 1.5 kg/day. For calves gaining in excess of this (which is common in grain-fed veal production), nutritional requirements must be extrapolated.

Daily nutrient requirements for growing large-breed calves fed only milk or milk replacer, and for calves fed milk or milk replacer plus a starter mix are presented in Table 1, below.

TABLE 1.
Daily nutrient requirements of veal calves

Live Weight kg (lb)	Gain g/day	Estimated Dry Matter Intake (kg)	Energy ME (Mcal)	Crude Protein (g)
Veal calves fed only milk or milk replacer				
40 (88)	300	0.49	2.32	104
	600	0.69	3.28	180
50 (110)	300	0.56	2.67	108
	600	0.78	3.71	185
	900	1.02	4.85	262
60 (132)	300	0.63	3.00	114
	600	0.86	4.10	190
	900	1.12	5.32	267
Veal calves fed milk or milk replacer plus starter				
50 (110)	400	0.76	3.15	154
	800	1.13	4.69	270
60 (132)	400	0.84	3.51	159
	800	1.24	5.16	275

Milk replacer recommendations (DM basis):
Ca: 1.0%, P: 0.7%, Vitamin A: 9,000 IU/kg,
Vitamin D: 600 IU/kg, Vitamin E: 50 IU/kg

Source: *Nutrient Requirements of Dairy Cattle*. Seventh Revised Edition. National Research Council, 2001.

TABLE 2.
Sample feeding schedule
(twice per day for a 45-kg (100-lb) calf)

	Milk replacer powder g/feeding	Water L/feeding	Feedings per day	Starter intake kg/day
Days 1–3	280	2.25	2	.05
Days 4–7	310	2.5	2	.05
Days 8–10	375	3.0	2	.1
Days 11–14	405	3.25	2	.15
Week 3	405	3.25	2	.2
Week 4	375	3.0	2	.5
Week 5	250	2.0	2	.9
Week 6	250	2.0	1	1.2

Calves have increased nutrient requirements when the air temperature drops below 10°C (50°F). To maintain body temperature at colder air temperatures, calves must use energy that would otherwise go to growth. Calves that are under 3 weeks of age need additional feed to compensate when the air temperature is below 15°C–20°C (59°F–68°F).

Table 3, below, applies to calves that are dry, well bedded and kept out of drafts. If they are not, the feed requirement will be even higher in cold temperatures.

TABLE 3.
Additional feed requirements needed by calves during cold weather

Temperature °C (°F)	50-kg calf, <3 weeks, additional milk replacer* (L)	50-kg calf, >3 weeks, additional milk replacer* (L)	75-kg calf, additional milk replacer (L)	weaned calves, calf starter or grain mix kg (lb)
20 °C (68 °F)	0	0	0	0
10 °C (50 °F)	0.9	0	0	0
0 °C (32 °F)	1.8	0.9	1.4	0.4 (.9)
-10 °C (14 °F)	2.7	1.8	2.7	0.8 (1.8)
-20 °C (-4 °F)	3.5	2.7	4.1	1.2 (2.6)

* 20% protein, 20% fat milk replacer mixed at 125 g/L

Source: Adapted from *Nutrient Requirements of Dairy Cattle*. Seventh Revised Edition. National Research Council, 2001, and *Nutrient Requirements of Beef Cattle*. National Research Council, 1996.

Milk Replacers

High-quality milk replacers utilize protein sources derived from milk components such as whey protein concentrate, dried skim milk and dried whey powder. Most milk replacers have 20%–22% crude protein (CP) with some formulations going to 26% CP. Fat levels from 17%–20% are usually recommended for the milk replacers fed to grain-fed veal calves.

Follow the manufacturer's recommendation for reconstituting and feeding milk replacers. Different brands have different properties. Most are reconstituted to a 12%–13% solids level, which is similar to whole milk. Use hot water and agitation to dissolve and emulsify the fats in the milk replacer.

Mix the milk replacer at the recommended temperature, which is typically about 60°C (140°F) for at least 3–5 min, then add cold water to bring the mixture to the desired feeding temperature of 38°C–40°C (100°F–104°F). Invest in a timer and a thermometer.

Water

Calves need to have water to drink, over and above what they get in milk replacer. Fresh, clean water is essential to calf growth. Water helps with the development of the rumen and the digestion of calf starter and allows earlier weaning. Test the water offered to calves and used to reconstitute milk replacers. The pH, mineral content and bacterial count are of primary concern. It may be necessary to install water treatment equipment to assure good water quality and hence economical production.

Water is the most essential and cheapest ingredient in any livestock feeding operation. Unfortunately, its importance is often overlooked. A 180-kg calf will require from 10–30 L of water daily, depending on such factors as temperature, humidity and the dry matter content of the diet. To achieve maximum gains, provide an adequate supply of clean, easily accessible water.

In 1984, research by A.F. Kertz at Ralston Purina found that weight gain between birth and 4 weeks of age was reduced by 38% and starter intake by 31% for calves that did not receive supplemental water in addition to their milk replacer.

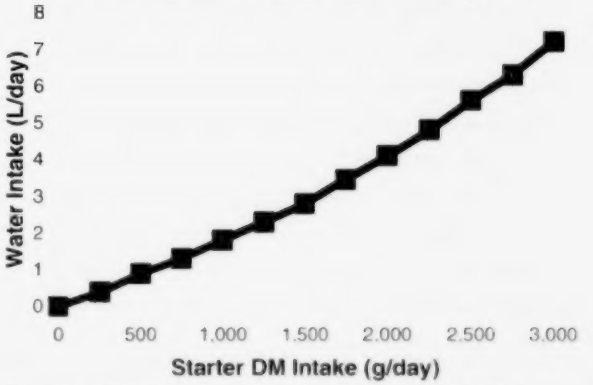
TABLE 4.
Effect of free-choice water on calf performance

	Water	
	Free choice	None
Daily gain (grams)	309	180
Calf starter intake (kg)	11.8	8.18
Scour days per calf	4.5	5.4

Source: Kertz, Ruettzel, & Mahoney. 1984. J.D.S. 67:2964–2969.

Dr. J. Quigley's research in 1999–2000, at the APC Calf Research Unit in Ames, Iowa, found that water intake by calves was closely correlated to starter intake. The more starter calves ate, the more water they drank. He determined that daily starter intake explained 60% of the variation in daily water consumption. During cold temperatures, supply calves with warm water if possible.

FIGURE 1.
Water intake vs. calf starter consumption



Source: J. Quigley. 2001. *Predicting Water Intake in Young Calves*. Calf Notes.com.

When weaning from liquid to solid feeds, provide an adequate and accessible supply of clean water for rapid adjustment and good health. Take time to familiarize newly weaned calves in group pens to the source of water. Using a garden hose and filling or adding to water bowls in full view of weaned calves can be helpful. Clean water troughs regularly.

Solid Feeds

Calf starters must have a high nutrient density, be very palatable and be offered fresh, twice daily.

Calves prefer textured feed or pelleted feeds over feeds with fine materials. Recent research has shown that average daily gain and efficiency of feed utilization is improved for calves that are fed whole corn or dry rolled corn versus steam-flaked corn and roasted rolled corn in the starter feed.

Most feeding guidelines suggest the introduction of calf starter at 3–5 days of age. On arrival, the age of purchased calves is often unknown. It is, therefore, recommended that calves be introduced to starter from the day they are acquired. Offer only limited quantities of starter initially. Feeding starter immediately after milk feeding is advantageous, since at this time calves are usually eager for more feed. Let the calf's appetite guide increases in the quantity offered. Recording daily feed intake and refusals allows the grower to monitor each calf individually, be alerted to possible sickness and determine precisely when calves can be weaned.

When calves are consuming 1–2 kg (2–4.5 lb) of starter daily, consider them to be at the rapid growth stage. Encourage greater consumption of starter through the gradual reduction of milk replacer at this time. Keep calves on starter until they achieve 70–80 kg (155–175 lb) bodyweight, at which time switch them to the corn:concentrate diet gradually, over 1–2 weeks.

According to *Nutrient Requirements of Dairy Cattle*, specifications for dry matter starter feeds include:

- 20% crude protein
- 0.7% calcium
- 0.45% phosphorus
- 4,000 IU/kg Vitamin A
- 600 IU/kg Vitamin D
- 25 IU/kg Vitamin E

Do not use urea in starter feeds.

Postpone the provision of free choice trace mineralized salt until after calves have been adapted to the corn:concentrate diet. This practice will eliminate the risk of calves overeating salt and possibly dying from toxicity.

The duration of the pre-weaning period varies depending on the initial weight of calves, their health, productivity and consumption of starter. Early weaning from a liquid diet reduces costs. Wean calves when they are healthy and consuming 1 kg of starter per day for 2–3 consecutive days. This usually occurs between 4 and 6 weeks, by which time they will have consumed 15–25 kg (33–55 lb) of milk replacer. Calves adjust quickly, and the intake of starter feed increases daily. Allowing calves to remain in their stalls for another 5–7 days after weaning helps reduce stress.

Keen observation for illness during the weaning process is vital. Some producers feed a small amount of hay (100 g/calf/day) top-dressed over the grain diet after weaning to entice calves to the feed bunk and to assist the grower in identifying sick calves. Carefully observe calves that do not accept hay when offered for health-related problems.

The transition to the main grain diet can be achieved in two ways. One method is to mix starter with an equal quantity of a 3:1 mixture of corn and concentrate. The other is to feed the starter separately from the corn and concentrate mixture. Ideally, calves should weigh 70–80 kg (155–175 lb) when started on a total grain and concentrate diet.

Protein Supplements

Protein quality is critical to the young calf. Because of its age and diet, rumen capacity is limited. Rations containing natural protein ingredients with a high by-pass value produce the best performance, although the economics may or may not be better than a program that includes urea.

Changing to concentrates containing urea may prove economical when calves weigh a minimum of 130 kg (285 lb), but it is important to do it gradually. Limit the use of urea in rations to supplying a maximum of 28%–33% of the total crude protein.

Most feeding programs involve the feeding of a constant amount of concentrate mixed with all the corn the calves will consume daily. As the calf size and corn intake increase, the corn:concentrate ratio gradually widens. Although this is the more practical method, a higher rate of gain and better feed efficiency will be obtained when requirements are more specifically met by formulating rations based on actual calf weights and desired performance.

Under these circumstances, the crude protein percentage of a 100% dry-matter ration will typically be 18.5% for a 90-kg (200-lb) calf. The equivalent corn:concentrate ratio would be 2.5:1 when a 36% CP protein supplement and dry shell corn are used. As fed, this ration would be about 16.5% CP.

As the calf grows to a market weight of 295–320 kg, the corn:concentrate ratio is typically widened to 5:1, resulting in a ration that has 15% dry-matter CP, or 13%–14% as fed when a 36% CP protein supplement and dry shell corn are used.

Whole-shelled corn is superior to all other grains in the production of grain-fed veal. Calves fed on other grains or combinations will not attain the desired finish at the required weight. Good-quality corn, which is air dried and free from fines, is best. Try to secure enough to take calves up to finishing weights without having to change to different batches of corn.

HOUSING AND FACILITIES

Calves have a lower critical temperature of 8°C–10°C (46°F–50°F). Calves less than 1 week of age have a higher minimum of 13°C–20°C (55°F–68°F). Below these temperatures, calves must divert energy away from growth and use it to produce heat to stay warm. Calves also have a higher critical temperature of about 26°C (79°F). Above this temperature, calves increase their respiration rate as a way of cooling.

Good ventilation is critical for successful grain-fed veal production. Strive to provide adequate fresh air, free from dust and drafts and reasonably free of pollutants (ammonia, carbon dioxide and air-borne pathogens). Table 5 shows required ventilation rates for veal calves (expressed in cubic ft/min). Minimum and maximum rates apply to winter and summer conditions, respectively. In controlled environments, temperatures may vary between 10°C–20°C (50°F–68°F), depending on the age and weight of the calves.

Aim to change the room air between 4 times per hour and 0.5–1 time per minute. A 55%–75% humidity is ideal.

TABLE 5.
Ventilation rates for veal calves

Calf weight kg(lb)	Minimum cfm*/calf	Maximum cfm*/calf
45 (100)	10	40
70 (155)	15	60
120 (265)	26	105
170 (375)	38	150
250 (550)	55	220
300 (660)	66	265

*cfm = cubic feet per minute

Calves can also be raised in naturally ventilated environments. The barn must be in a location exposed to summer winds and have adjustable sidewall openings and ridge openings to ventilate it naturally.

It is very important to provide clean, dry, well-ventilated and -bedded facilities with adequate space per calf. Use feed and water troughs whose height and design minimize contamination with manure. Control flies, rodents and birds.

From weaning to market, space requirements will increase from 2.2 m^2 to 3.5 m^2 (24 ft^2–38 ft^2) per calf for the pack area required to house calves in group housing.

Best management practice is to keep the calves in their original group as they grow and move through the production cycle. Each time a calf is moved, there is stress and the potential for disease to set in. Maintaining common calf groups helps reduce stress.

When feed is continuously available, 20–30 cm (8–12 in.) of manger space per calf is typical. If calves are jostling and butting each other out of the way at the manger immediately after they are fed, either there is insufficient manger width or the feed is not available for long enough. Feed at the manger should never run out. If it does, calves will develop the tendency to eat very rapidly, swallowing more whole corn instead of taking the time to chew it. In extreme cases, where all calves try to eat at once, up to 55 cm (21 in.) of bunk width per calf may be needed.

Feed bunks should have a maximum throat height that ranges from 35 cm (14 in.) for a 100-kg (220-lb) calf to 45 cm (18 in.) for a 300-kg (660-lb) calf. Adjustable neck rails will reduce feed wastage and accommodate animals of different sizes.

HEALTH MANAGEMENT

Do not use antibiotics as a substitute for good management and a clean, sanitary environment. Consult your veterinarian and always read labels and follow dosage and withdrawal recommendations.

However, when necessary, antibiotics are particularly beneficial to young calves exposed to adverse conditions of sanitation, housing and disease. Maintain a close working relationship with veterinarians and a good record-keeping system to develop individual farm herd health programs. Over time, producers become familiar with the symptoms of various diseases and the use and dosages of specific antimicrobial drugs for treatments.

Health costs rank third after feed and calf purchase costs in the production of grain-fed veal. Common diseases and parasites of grain-fed veal calves include pneumonia, scours, septicemia, bloat (indigestion), coccidiosis, lice, ringworm and salmonellosis. High levels of management and keen observation are required to prevent, detect and treat sickness promptly when it occurs.

Indicators of health

- Hair coat should be flat and shiny. Wet hair coats indicate excessive humidity. Hair standing on end indicates a cold calf.
- Unusual variations in manure are cause for concern. Learn to associate the colour and consistency of manure with the age and diet of your calves.
- Discharge from eyes, nose and mouth is usually indicative of respiratory abnormalities.
- Navels should be dry, not sore, hot or swollen.
- Inspect leg joints — knees and hocks — for swellings, stiffness and sores.
- Rapid, laboured breathing or breathing accompanied by coughs are all signs of respiratory disease.
- Normal temperature is 38.6°C (101.5°F). Above 39.4°C (102.9°F) requires investigation and possibly medication.
- A reduction in feed intake is one of the earliest signs of potential disease occurrence.
- Calves should have a bright and alert attitude, with good coordination and an aggressive appetite.

Vaccination

Determining whether to vaccinate will depend on individual health programs, past experience and consultation with your veterinarian. Calves that have received adequate immunoglobulins from colostrum may not respond to vaccination because they already have protection.

Many veal calves receive an inadequate amount of colostrum or colostrum that is low in immunoglobulins. For these calves, immunization with vaccines may prove beneficial.

Repeat dosages may be necessary; timing is critical, and protection can be unpredictable. Generally, only modified live vaccines are recommended for calves.

MARKETING

Holstein calves fed as grain-fed veal form the most uniform group of cattle marketed in the beef industry. In addition to the unique similarity of carcasses, the advantage of grain-fed veal to the packer is the lack of excess trimmable fat. To the consumer, veal offers a product low in fat and cholesterol and rich in iron and protein.

Finished calves are sold at auctions, direct to packers and through order buyers. Prices obtained at auctions will vary with supply and demand, weather, volume and quality of calves, together with buyer competition. Calves with a carcass weight, hide off, of over 180 kg (396 lb) are not considered veal in Canada and are usually price discounted. Producing a narrow range in weight for a group of calves (rather than producing calves that are too light or too heavy) will build a good reputation for the producer. Direct marketing also has the advantage of producing carcasses with fewer blemishes and better colour.

Producers must prepare calves for market. The best auction prices are obtained for clean, well-finished calves weighing 295–320 kg (650–705 lb). To achieve this goal, weigh the calves to determine when they have reached proper shipping weight and provide good nutrition throughout their lives. Keeping them in well-bedded pens for 2–3 weeks before sale will produce clean animals. Group calves by weight and degree of finish. Be available to assist with loading if necessary and insist that calves be transported in clean, well-bedded trucks.

RECORDS

Detailed records on individual calves or batches of calves serve as a tool in management decisions. Some of these decisions will involve the relative efficiency of various feeds, the health and productivity of calves from various suppliers and locations, and the identification of poor gainers and individual calf profitability.

Useful records include:

- calf identification
- source of calves — price, condition and date of arrival
- daily and cumulative feed consumption and cost
- changes in manure consistency
- disease diagnosis
- body temperature
- medications used — dosages, efficacy, withdrawal time and costs
- results of post-mortems
- calf weight on arrival, at weaning and when sold
- price received and date sold

SOURCES OF ADDITIONAL INFORMATION

Building the Foundation for Healthy Calves. Ontario Veal Association, 2004.

Current Research for Improved Calf and Heifer Raising. American Dairy Science Society, 2001.

Davis, Carl L., and James K. Drackley. *Development, Nutrition, and Management of the Young Calf.* Iowa State University Press, 1998.

Feeding the Post-Weaned Grain-Fed Veal Calf. Shur-Gain, 2004.

Guide Veau lourd. Conseil des productions animales du Québec, 1999 (French only).

Holstein Beef Production, Natural Resource. Agriculture and Engineering Service, 1991.

Nutrient Requirements of Dairy Cattle. Seventh Revised Edition. National Research Council, National Academy Press, 2001.

Recommended Code of Practice for the Care and Handling of Veal Calves. Canadian Agri-Food Research, 1998.

OMAFRA Factsheet, Order No. 81-048, *Starting the Dairy Calf.*

www.calfnotes.com

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POD
ISSN 1198-712X
Également disponible en français
(commande n° 06-084)

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